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NOTES FROM PACIFIC COAST OBSERVATORIES.

NOTE ON THE RELATIVE VELOCITIES OBSERVED WITHIN SOME OF THE PLANETARY NEBULÆ.

Since our announcement of the discovery of spectroscopic evidence of the rotation of the planetary nebula N. G. C. 7009 (R. A. = $20^{\text{h}} 58^{\text{m}}$), we have extended the observations to a number of well-known planetaries. We have obtained spectrograms, with high dispersion for this line of investigation, of the following objects:

N. G. C. 418	= $5^{\text{h}} 22^{\text{m}}.9$	= $-12^{\circ} 46'$
N. G. C. 2392	7 23 .3	+21 7
N. G. C. ₂ 3568	12 30 .4	+83 7
N. G. C. 6210	16 40 .3	+23 59
N. G. C. 6543	17 58 .6	+66 38
N. G. C. 6572	18 7 .2	+ 6 50
N. G. C. 7009	20 58 .7	-11 46
N. G. C. 7027	21 3 .3	+41 50

Our spectrograms of N. G. C. 418 and N. G. C.₂ 3568 show no inclination of the nebular lines, while those of all the other objects give marked evidence of relative motion within them. With the exception of N. G. C. 2392 the results for the relative motions within each nebula appear to be capable of interpretation on the hypothesis that the nebula is rotating, altho there are indications, at least for the outer portions of some of these objects that the phenomenon may be more complicated than that due to simple rotation.

Two spectrograms of N. G. C. 2392 obtained with the slit passing centrally across the nebular image in position angles respectively 5° and 95° show lines of a remarkable form. The shape of the lines is similar in the two spectrograms, and their central and brighter section, corresponding to the central portion of the nebula, some 11 or 12 seconds of arc in diameter, is roughly that of a drawn bow concave toward the

violet. Measures of these lines indicate a relative velocity of some 80 km./sec. for points at the ends with reference to the middle point of the bow. We do not undertake now to interpret the remarkable line form observed, but shall hope to do so later.

W. W. CAMPBELL.
J. H. MOORE.

May, 1916.

ON THE ROTATION OF THE PLANETARY NEBULA N. G. C. 6572.

We have recently secured a number of observations of the well-known planetary nebula Struve 6, or N. G. C. 6572, with spectrographs of high dispersion, in order to test it for possible evidence of rotation. This nebula, one of the brightest of its class, is oval in form with a bright nucleus near the center. The brighter portions, as recorded on photographs of short exposure with the Crossley reflector, have diameters of 9 and 14 seconds of arc along the minor and major axes, respectively, while on long exposure photographs these diameters are about 13 and 16 seconds of arc. The major axis is in position angle 0° , or north and south.

Beginning with November 30, 1915, we have secured a series of spectrograms with two three-prism spectrographs having cameras of focal lengths, respectively, 16 and 32 inches. These spectrograms, taken with the slit of the spectrograph in position angles 0° , 45° , 135° , and 180° , give nebular lines whose form is approximately that of a very shallow letter S.

Our preliminary results indicate that the central portion of the nebula N. G. C. 6572, some 3 seconds of arc in diameter, is rotating about an axis in position angle approximately 90° . The relative velocity of the points at the extremities of this diameter is of the order of 5 or 6 kilometers per second. The direction of rotation of the central portion is in the sense that a point on the major axis north of the center is receding, while a point south of the center is approaching us. The inclination of the outer ends of the lines corresponding to